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## (54) THERMOPLASTIC POLYESTER RESIN COMPOSITION

## (57)Abstract

PROBLEM TO BE SOLVED: To provide a polyester resin composition having an improved dimensional precision, sliding property and flame retardance, and a molded product using the composition.

SOLUTION: A thermoplastic polyester resin contains (A) a thermoplastic polyester resin, (B) a polymer having a bisphenol skeleton, (C) a modified olefin polymer which is modified with at least one chosen from unsaturated carboxylic acids and derivatives thereof, (D) an aliphatic ester having a molecular weight of 400 to 1,000 and (E) a phosphorus-containing compound. The thermoplastic polyester resin composition may further contain (F) a fluorine resin or the like. The thermoplastic polyester resin composition is useful for preparing a molded product such as sliding members (especially gears), etc.

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CLAIMS

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## [Claim(s)]

[Claim 1] (A) The thermoplastic polyester resin constituent containing thermoplastic polyester resin, the polymer which has (B) bisphenol frame, the denaturation olefin system polymer which denaturalized by at least one sort chosen from (C) unsaturated carboxylic acid and its derivative, the aliphatic series ester of the (D) molecular weight 400-1000, and (E) Lynn content compound.

[Claim 2] The thermoplastic polyester resin constituent according to claim 1 whose thermoplastic polyester resin (A) is polyalkylene ant rate system resin which includes an alkylene ant rate unit at least 60% of the weight.

[Claim 3] The thermoplastic polyester resin constituent according to claim 2 whose polyalkylene ant rate system resin is polybutylene terephthalate system resin or polybutylene naphthalate system resin.

[Claim 4] Claim 1 whose polymer (B) which has a bisphenol frame is a polymer which has the bisphenol A frame Thermoplastic polyester resin constituent of a publication.

[Claim 5] The thermoplastic polyester resin constituent according to claim 4 whose polymer which has the bisphenol A frame is at least one sort chosen from polycarbonate resin, an epoxy resin, phenoxy resin, and polyarylate resin.

[Claim 6] The thermoplastic polyester resin constituent according to claim 5 whose polymer which has the bisphenol A frame is polycarbonate resin.

[Claim 7] The thermoplastic polyester resin constituent according to claim 1 whose denaturation olefin system polymer (C) is a polymer which denaturalized the olefin system polymer (c-1) with unsaturated carboxylic acid or its derivative (c-2).

[Claim 8] The thermoplastic polyester resin constituent according to claim 7 unsaturated carboxylic acid or its derivative (c-2) of whose is a maleic anhydride and/or (meta) an acrylic acid.

[Claim 9] The thermoplastic polyester resin constituent according to claim 8 whose amount of denaturation by the maleic anhydride and (meta) acrylic acid in a denaturation olefin system polymer (C) is 0.1 - 5 % of the weight.

[Claim 10] The thermoplastic polyester resin constituent according to claim 7 whose olefin system polymer (c-1) is a copolymer of the homopolymer of an olefin system monomer, a copolymer or said olefin system monomer, and alpha and beta-unsaturated-carboxylic-acid ester.

[Claim 11] The thermoplastic polyester resin constituent according to claim 10 whose olefin system monomer is ethylene or a propylene.

[Claim 12] The thermoplastic polyester resin constituent according to claim 10 whose olefin system polymer (c-1) is at least one sort chosen from polyethylene, polypropylene, a polyethylene-propylene copolymer, an ethylene-(meta) methyl-acrylate copolymer, and an ethylene-(meta) ethyl-acrylate copolymer.

[Claim 13] The thermoplastic polyester resin constituent according to claim 1 whose Lynn content compound (E) is red phosphorus.

[Claim 14] thermoplastic polyester -- resin -- ( -- A -- ) -- 100 -- weight -- the section -- receiving -- a bisphenol -- a frame -- having -- a polymer -- ( -- B -- ) -- ten - 100 -- weight -- the section -- containing -- being according to claim 1 -- thermoplastic polyester -- resin -- a constituent .

[Claim 15] The thermoplastic polyester resin constituent according to claim 1 or 14 which contains 1 - 20 weight section for the Lynn content compound (E) to the total amount 100 weight section of thermoplastic polyester resin (A) and the polymer (B) which has a bisphenol frame.

[Claim 16] thermoplastic polyester -- resin -- ( -- A -- ) -- a bisphenol -- a frame -- having -- a polymer -- ( -- B -- ) -- a total amount -- 100 -- weight -- the section -- receiving -- denaturation -- an olefin -- a system -- a polymer -- ( -- C -- ) -- 0.5 - 18 -- weight -- the section -- and -- aliphatic series -- ester -- ( -- D -- ) -- 0.2 - eight -- weight -- the section -- containing -- being according to claim 1 or 15 -- thermoplastic polyester -- resin -- a constituent .

[Claim 17] (F) The thermoplastic polyester resin constituent according to claim 1 which contains fluoro resin further.

[Claim 18] The thermoplastic polyester resin constituent according to claim 17 with which fluoro resin (F) contains polytetrafluoroethylene at least.

[Claim 19] Thermoplastic polyester resin according to claim 17 which contains the 0.1 - 1.5 weight section for fluoro resin (F) to the total amount 100 weight section of a polymer (B) which has thermoplastic polyester resin (A) and a bisphenol frame.

[Claim 20] Said component (A) and total amount 100 weight section with (B) are received to the polybutylene terephthalate system (resin A) 100 weight section including the bisphenol A mold polycarbonate (B) 20 - 90 weight sections. (C) The polyethylene which denaturalized with the maleic anhydride and/or (meta) the acrylic acid or the

ethylene-ethyl-acrylate copolymer 1 - 10 weight sections, and (D) saturation C 14-24 Fatty acid, Saturation C 14-24 Fatty alcohol and C 2-4 Alkylene diol and C 3-6 The aliphatic series ester 0.2 of the molecular weight 400-1000 which consisted of saturation fatty alcohol chosen from alkane triol - 8 weight sections, (E) Thermoplastic polyester resin constituent containing red phosphorus 5 - 15 weight sections, and the (F) polytetrafluoroethylene 0 - 1 weight section according to claim 1.

[Claim 21] The thermoplastic polyester resin constituent according to claim 20 whose amount of denaturation by the maleic anhydride and/or (meta) acrylic acid in a component (C) is 0.1 - 4 % of the weight.

[Claim 22] (A) How to mix thermoplastic polyester resin, the polymer which has (B) bisphenol frame, the denaturation olefin system polymer which denaturalized by at least one sort chosen from (C) unsaturated carboxylic acid and its derivative, the aliphatic series ester of the (D) molecular weight 400-1000, and (E) Lynn content compound, and to manufacture a thermoplastic polyester resin constituent.

[Claim 23] (F) The manufacture approach according to claim 22 which mixes fluororesin further.

[Claim 24] The slide member currently formed with the thermoplastic polyester resin constituent according to claim 1 to 21.

[Claim 25] The slide member according to claim 24 which is a gear.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a thermoplastics constituent useful although the slide member which has outstanding antifriction and wear property, and has the outstanding fire retardancy is obtained including thermoplastic polyester resin, a specific denaturation polyolefine system polymer, an ester compound, and the flame retarder of specific combination, its manufacture approach, and the mold goods using it.

[0002]

[Description of the Prior Art] Crystalline thermoplastic polyester resin (for example, polyalkylene terephthalate resin etc.) is excellent in a mechanical property, an electrical property, and physical [ other ] and chemical property, and since workability is good, it is used for extensive applications, such as an automobile, electrical and electric equipment, and electronic parts, as engineering plastics. Even when such crystalline thermoplastic polyester resin is independent, it is available to various mold goods, but in order to improve the property, especially a mechanical characteristic depending on a field of the invention, it adds various reinforcements and additives and shaping is presented with it.

[0003] However, the demand characteristics in such a field are developed gradually, and much more improvement in a sliding property or dimensional accuracy is desired as the example. For example, in operation systems, such as a video tape recorder, a tape recorder, and a printer, much more improvement in tone quality or image quality is called for. The dimensional accuracy of the slide members (gear etc.) used as main driving parts in such an operation system is one of the important examination technical problems, in order that itself may have big effect on sound playback, printing, etc. directly. Furthermore, a slide member is expected to maintain precision also not only in early dimensional accuracy but in long-term use. Furthermore, the request to the ingredient excellent in a gearing wear property or abrasion resistance with axial material (metal shaft etc.) is also high.

[0004] Moreover, it is required that a printer and facsimile should also give fire retardancy to operation system components from the point of safety. In the former, there is no resin ingredient which has fire retardancy, sliding nature, and shaping precision on high level, and grease is applied to the fire retarding material of common use, or it uses non-fire retarding materials, such as polyacetal, for it in many cases. However, spreading of grease makes the toner used for printing fix, and checks the drive stability of a gear, and wear of a gear is promoted remarkably. Furthermore, since the ingredient itself is inferior to the gear wear property of the \*\* material itself, and a sliding property with a metal, large degradation arises with a grease piece.

[0005] Although the ingredient which blended the fluororesin is conventionally used for the slide member (for example, gear material), both of the gearing wear by the poor precision by the mold deposit by separation from the fall of the gear precision originating in the anisotropy of a fluororesin and the polyester resin of a fluororesin, the material for a metal, and \*\*\*\* material cannot fully be improved, but an ingredient with which the antiwear characteristic was improved is desired.

[0006] In order to improve sliding nature and fabrication nature, the resin constituent which distributed polyolefine system resin in the state of specific distribution in polyester system resin is indicated by JP,5-9369,A. However, in the combination of polyester system resin and polyolefin resin, the dimensional accuracy and the sliding property of a resin constituent are not greatly improvable. Moreover, grant of a specific flame retarder is not concretely indicated by this reference.

[0007] In order to improve a moldability and a surface exfoliation phenomenon, the resin constituent containing thermoplastic polyester resin, the ethylene- $\alpha$  olefin copolymer or ethylene-unsaturated-carboxylic-acid ester copolymer by which graft denaturation was carried out with unsaturated carboxylic acid, and a bis-oxazoline compound is indicated by JP,3-35050,A. It is also indicated that the fatty acid ester of polyhydric alcohol may be included in this reference. However, in such a resin constituent, a moldability and sliding nature are not certainly improvable. In addition, grant of a specific flame retarder is not concretely indicated by this reference, either.

[0008] The good polyester resin of the sliding nature which contains in JP,7-150022,A crystalline thermoplastic polyester resin, the olefin system polymer which consisted of olefin system polymer fragmentation and vinyl system polymer fragmentation, and the fatty acid ester obtained from a with a carbon numbers of 12 or more fatty acid is indicated. However, such a resin constituent of an improvement of a moldability and a sliding property is also inadequate. Moreover, JP,7-150022,A is indicating the combination of a halogen content organic flame retarder, and an antimony, tin, aluminum and the fire-resistant assistant of a magnesium system. However, the fire-resistant improvement of such a resin constituent is inadequate. Furthermore, in a halogen series flame retardant, a dioxin

system compound may be generated so much at the time of combustion decomposition, and it is not desirable on an environment.

[0009]

[Problem(s) to be Solved by the Invention] Therefore, the purpose of this invention is to offer the thermoplastic polyester resin constituent with which dimensional accuracy and a sliding property have been improved sharply, its manufacture approach, and the slide member using it.

[0010] Other purposes of this invention are to offer the polyester resin constituent equipped not only with good dimensional accuracy and a sliding property but good fire retardancy, its manufacture approach, and the slide member using it.

[0011] Another purpose of this invention is offering the non-halogen series flame retardant content polyester resin constituent by which flameproofing's was carried out on high level. The purpose of further others of this invention is offering the slide member by which fire retardancy's has been improved.

[0012]

[Means for Solving the Problem] this invention persons completed a header and this invention for the resin constituent which has the fire retardancy which excelled and was excellent not only in a moldability but the sliding property being obtained, when thermoplastic polyester resin, the specific denaturation polyolefine system copolymer, the ester compound of specific molecular weight, the specific non-halogen series flame retardant, and the Lynn content compound were wholeheartedly combined about crystalline thermoplastic polyester resin as a result of examination that said technical problem should be attained.

[0013] That is, the thermoplastic polyester resin constituent of this invention contains (A) thermoplastic polyester resin, the polymer which has (B) bisphenol frame, the denaturation olefin system polymer which denaturalized by at least one sort chosen from (C) unsaturated carboxylic acid and its derivative, the aliphatic series ester of the (D) molecular weight 400-1000, and (E) Lynn content compound. As thermoplastic polyester resin, polybutylene terephthalate system resin or polybutylene naphthalate system resin can be used. The polymer which has the bisphenol A frame can be used for the polymer which has a bisphenol frame, and the olefin system polymer which denaturalized with the maleic anhydride and/or (meta) the acrylic acid is contained in a denaturation olefin system polymer (C). Red phosphorus is contained in the Lynn content compound (E). Moreover, the thermoplastic polyester resin constituent of this invention may contain (F) fluororesin (for example, polytetrafluoroethylene) etc.

[0014] In this invention, said component (A), (B), (C), (D), and (E) are mixed, and a thermoplastic polyester resin constituent is manufactured. In this approach, (F) fluororesin may be mixed further.

[0015] Said polyester resin constituent is useful when obtaining mold goods, such as a slide member (especially gear). In addition, in this specification, an "acrylic acid" and a "methacrylic acid" may be named generically, and it may be called "an acrylic acid (meta)."

[0016]

[Embodiment of the Invention] The thermoplastic polyester resin (A) used by [thermoplastic polyester resin (A)] this invention can be obtained according to the polycondensation of a dicarboxylic acid component and a dihydroxy component, the polycondensation of a hydroxy acid component, or the polycondensation of these 3 component, and may be gay polyester, or may be copoly ester.

[0017] as said dicarboxylic acid component — aromatic carboxylic acid (a terephthalic acid —) Isophthalic acid, a phthalic acid, naphthalene dicarboxylic acid (2, 6-naphthalene dicarboxylic acid, etc.), A diphenyl carboxylic acid, diphenyl ether dicarboxylic acid, diphenylmethane dicarboxylic acid, C8-16 aromatic-series dicarboxylic acid, such as bibenzyl dicarboxylic acid, Alicycle group dicarboxylic acid (for example, C4-10 cycloalkane dicarboxylic acid, such as cyclohexane dicarboxylic acid), aliphatic series dicarboxylic acid (for example, C6-12 aliphatic-series dicarboxylic acid, such as an adipic acid, an azelaic acid, and a sebacic acid), or the derivative of that can be illustrated. As said derivative, acid halide, such as low-grade alkyl ester, such as the derivative in which ester formation is possible, for example, dimethyl ester etc., an acid anhydride, and acid chloride, is illustrated. these dicarboxylic acid components are independent — or two or more sorts can be used, combining. A desirable dicarboxylic acid component is aromatic series dicarboxylic acid (especially a terephthalic acid, naphthalene dicarboxylic acid).

[0018] as said dihydroxy component — for example, aliphatic series diol (ethylene glycol —) Propylene glycol, 1,3-butanediol, 1,4-butanediol, C2-10 alkylene diols, such as neopentyl glycol and hexandiol, Alicycle group diol (C4-12 alicycle group diols, such as cyclohexane diol and cyclohexane dimethanol), aromatic series diol (hydroquinone, resorcinol, and dihydroxy phenyl —) C6-16 aromatic-series diols, such as naphthalene diol, dihydroxy diphenyl ether, 2, and 2-screw (4-hydroxyphenyl) propane (bisphenol A), The alkylene oxide adduct of said aromatic series diol (for example, C 2-4 of bisphenol A, such as diethoxy-ized bisphenol A, alkylene oxide adduct), Polyoxy alkylene glycol (for example, polyoxy C 2-4, such as polyoxy ethylene glycol, a polyoxypropylene glycol, and a polytetramethylene ether glycol alkylene glycol) etc. can be illustrated. These dihydroxy components may be the derivative in which ester formation is possible, for example, an alkyl group, an alkoxy group, or a halogenation object. these diol components are independent — or two or more sorts can be used, combining. Alkylene diol (it is especially C 2-4 alkylene diol) and alicycle group diol are used among these dihydroxy components in many cases.

[0019] Moreover, as hydroxy acid, hydroxy acid, such as an oxy-benzoic acid, an oxy-naphthoic acid, and diphenylene hydroxy acid, and these derivatives can be illustrated, and the derivative corresponding to said dicarboxylic acid component and a dihydroxy component is contained in a derivative. these compounds — a kind — or two or more sorts can be used, combining. furthermore, the need — a polyfunctional monomer, for example, a

TORIMETTO acid, trimesic acid, and pylori — a helmet — little concomitant use of the polyhydric alcohol, such as multiple-valued carboxylic acids, such as an acid, a glycerol, trimethylol propane, trimethyloethane, and pentaerythritol, may be carried out. The polyester which has branching or the structure of cross linkage generated by use of such a polyfunctional monomer can also be used.

[0020] The thermoplastic polyester generated according to a polycondensation by using the above-mentioned compound as a monomer component is independent, or is combined two or more sorts and used as basic resin of a thermoplastics constituent. Although said polyester resin may be crystallinity or may be amorphous nature, it is desirable that it is crystallinity.

[0021] Desirable thermoplastic polyester resin (A) is crystalline aromatic polyester (namely, resin constituent which uses as a principal component the gay polyester resin which uses an alkylene ant rate unit as a principal component, copoly ester resin, a gay, or copoly ester resin), for example, polyalkylene ant rate system resin. A polyalkylene ant rate (for example, poly C 2-4, such as polyethylene terephthalate and polybutylene terephthalate poly C 2-4, such as alkylene terephthalate, polyethylenenaphthalate, and polybutylene naphthalate alkylene naphthalate) etc. is contained in the above-mentioned gay polyester resin. Moreover, the polyalkylene ant rate which has an alkylene ant rate unit at least 60% of the weight or more in the above-mentioned copoly ester resin (for example, the copolymer which has an alkylene ant rate (especially butylene terephthalate) unit about 60 to 98% of the weight is contained.) The desirable KO monomer which forms copoly ester is C 2-4. Alkylene glycol and polyoxy C 2-4 They are alkylene glycol, isophthalic acid, a phthalic acid, etc. The constituent which carries out content of said gay polyester resin (especially polybutylene terephthalate) or said copoly ester resin (especially polybutylene terephthalate system copoly ester) by alkylene ant rate unit conversion at least 60% of the weight (for example, about 60 - 95 % of the weight) is contained in the poly alkyl ant rate system resin constituent. Especially, polybutylene terephthalate system resin [the resin constituent containing polybutylene terephthalate, copoly butylene terephthalate (copolymer), these gays, or copoly butylene terephthalate] is desirable.

[0022] The limiting viscosity number (solvent : o-chlorophenol; temperature : 35 degrees C) of polyester resin, such as polybutylene terephthalate system resin, is 0.7 to about 1.0 preferably [ it is desirable and ] to 0.6-1.2, and a pan 0.5 or more. If the mechanical property of a resin constituent falls and a limiting viscosity number exceeds 1.2 less than by 0.5, the fluidity of the resin constituent at the time of shaping will fall.

[0023] The polymer (B) which has the bisphenol frame used by [polymer [ which has a bisphenol frame ] (B)] this invention is a polymer guided from bisphenols, for example, polycarbonate resin, an epoxy resin, phenoxy resin, polyarylate resin, etc. are contained. These polymers are independent, or they can be used, combining them two or more sorts.

[0024] As bisphenols, for example Screw (hydroxy aryl) alkane [screw (4-hydroxyphenyl) methane (= bisphenol F), 1 and 1-screw (4-hydroxyphenyl ethane) (= bisphenol A D), 2 and 2-screw (4-hydroxyphenyl propane) (= bisphenol A), 2 and 2-screw (4-hydroxy-3-methylphenyl) propane, Screws C 1-6, such as 2 and 2-screw (4-hydroxyphenyl) butane (hydroxy aryl)], such as an alkane; [ Screw (hydroxy aryl) cycloalkane [1 and 1-screw (4-hydroxyphenyl) hexane, ] 1 and 1-screw Screws, such as a pentane (4-hydroxyphenyl) ], such as three to C12 cycloalkane (Hydroxy aryl) 4 and 4'-dihydroxy biphenyl; 2, 2'-biphenol; 4, 4'-dihydroxy diphenyl ether; 4, 4'-dihydroxy diphenylsulfone; 4, 4'-dihydroxydiphenyl sulfide; 4, 4'-dihydroxy diphenyl ketone; Halogenation bisphenols (The dichlorobis phenol A, the dibromobis phenol A, tetra-bisphenol A, tetrabromobisphenol A, etc.) etc. — it is mentioned. Especially bisphenol A is desirable in these bisphenols. these bisphenols are independent — or two or more sorts can be used, combining.

(1) The polymer obtained by the reaction with the above-mentioned bisphenols and carbonates, such as a phosgene or diphenyl carbonate, is contained in the polycarbonate resin which has the polycarbonate resin bisphenol frame which has a bisphenol frame. polycarbonate resin is independent — or two or more sorts can be used, combining.

[0025] As desirable polycarbonate resin, the polycarbonate resin which consists of one to screw (hydroxy aryl) C6 alkanes, especially bisphenol A mold polycarbonate resin are mentioned.

[0026] the number average molecular weight of the obtained polycarbonate resin — for example, it is 20,000 to about 40,000 still more preferably 10,000 to about 40,000 preferably 1,500 to about 50,000.

(2) As an epoxy resin which has the epoxy resin or phenoxy resin bisphenol frame which has a bisphenol frame, it is a screw (hydroxy aryl) C 1-6. Glycidyl ether, such as an alkane especially bisphenol A, bisphenol A D, and Bisphenol F, is mentioned. Moreover, said bisphenol glycidyl ether with big molecular weight (namely, phenoxy resin) is also contained in the epoxy resin which has a bisphenol frame. Desirable resin is the bisphenol A mold epoxy resin or phenoxy resin. the epoxy resin and phenoxy resin which have these bisphenol frames are independent — or two or more sorts can be used, combining.

[0027] the number average molecular weight of an epoxy resin — for example, it is 400 to about 6,000 (400 to about [ for example, ] 5,000) still more preferably 300 to about 10,000 preferably 200 to about 50,000. moreover, the number average molecular weight of phenoxy resin — for example, it is 3,000 to about 35,000 still more preferably 2,000 to about 40,000 preferably 1000 to about 50,000.

[0028] In a resin constituent, an epoxy resin or phenoxy resin may be hardened if needed with curing agents, such as an amine system curing agent, the poly amino amides (for example, aromatic amines, such as fatty amine [ , such as ethylenediamine, ], meta-phenylenediamine, and xylylene diamine etc.) system curing agent, an acid, and an acid-anhydride system curing agent.

(3) The polyarylate system resin which has the polyarylate system resin bisphenol frame which has a bisphenol frame can be manufactured using a melting polymerization method, a solution polymerization method, or interfacial

polymerization using bisphenols and an aromatic-polycarboxylic-acids component by esterification reactions, such as ester interchange methods (for example, an acetate process, the phenyl ester method, etc.), an acid chloride method, and a direct method, etc.

[0029] For example, one to screw (hydroxy aryl) C6 alkanes (for example, bisphenol A, Bisphenol F, bisphenol A D, etc.) etc. are contained in desirable bisphenols.

[0030] As aromatic polycarboxylic acids (monomer), dicarboxylic acid, such as monocycle type aromatic series dicarboxylic acid and polycyclic-aromatics dicarboxylic acid, or those reactant derivatives (for example, [acid halide (acid chloride etc.), ester (alkyl ester, aryl ester, etc.), an acid anhydride], etc.) are mentioned, for example.

[0031] With a carbon number [ of benzene dicarboxylic acid, such as a phthalic acid, isophthalic acid, and a terephthalic acid, etc. ] of about eight to 20 aryl dicarboxylic acid is mentioned to monocycle type aromatic series dicarboxylic acid.

[0032] as polycyclic-aromatics dicarboxylic acid — naphthalene dicarboxylic acid, such as 2 and 6-naphthalene dicarboxylic acid, and screw (aryl carboxylic acid) [— for example Biphenyl dicarboxylic acid, screw (carboxyphenyl) methane, screw (carboxyphenyl) ethane, A screw Screws, such as a propane (Carboxyphenyl) C 1-6 (Carboxy aryl) Alkane; A screw Screws, such as a cyclohexane (Carboxyphenyl) (Carboxy aryl) three to C12 cycloalkane; — screw (carboxyphenyl) ketone; — screw (carboxyphenyl) sulfoxide; — screw (carboxyphenyl) ether; —], such as a screw (carboxyphenyl) thioether, etc. is mentioned.

[0033] In a desirable aromatic-polycarboxylic-acids component, they are monocycle type aromatic series dicarboxylic acid (especially benzene dicarboxylic acid, such as a phthalic acid, isophthalic acid, and a terephthalic acid), naphthalene dicarboxylic acid, and a screw (4-carboxyphenyl) C 1-4. An alkane etc. is contained.

[0034] In addition, in the ring of said aromatic series dicarboxylic acid, it is 1 or two C 1-4. The alkyl group may permute. These aromatic series dicarboxylic acid is independent, or it can be used, combining it two or more sorts.

[0035] The polyester of polyester with for example, bisphenols (bisphenol A, bisphenol A D, bisphenol F, etc.) and benzene dicarboxylic acid (isophthalic acid, terephthalic acid, etc.), bisphenols and a naphthalene carboxylic acid, or screws (aryl carboxylic acid) [for example, screw (carboxy aryl) C1-4 alkyls, such as screw (carboxyphenyl) methane, screw (carboxyphenyl) ethane, and a screw (carboxyphenyl) propane,] etc. is mentioned to desirable polyarylate resin. These polyarylate system resin is independent, or it can be used, combining it two or more sorts.

[0036] In addition, said a part of bisphenols may be permuted by aliphatic series or alicyclic diol. As aliphatic series diol, C2-10 aliphatic-series diols, such as ethylene glycol, propylene glycol, butanediol, hexandiol, and neopentyl glycol, are mentioned, and the diol which has C3-10 aliphatic-series rings, such as 1, 4-cyclohexane dimethanol, and cyclohexane diol, is contained in alicyclic diol.

[0037] Moreover, aliphatic series or alicyclic group dicarboxylic acid may permute said some of aromatic polycarboxylic acids. As aliphatic series dicarboxylic acid, C2-20 aliphatic-series dicarboxylic acid, such as an adipic acid, a pimelic acid, a suberic acid, an azelaic acid, a sebacic acid, and dodecane diacid, is mentioned, and cyclohexane dicarboxylic acid etc. is contained as alicyclic dicarboxylic acid, for example.

[0038] Moreover, in addition to bisphenols and aromatic series dicarboxylic acid, polyarylate resin may use together aromatic series triol, aromatic series tetra-ol [for example, 1, 1, 2, and 2-tetrakis (hydroxyphenyl) ethane] etc., aromatic series tricarboxylic acid, aromatic series tetracarboxylic acid, etc. if needed.

[0039] Furthermore, as for the end of polyarylate resin, it may be blocked with alcohols and carboxylic acids (association). (especially the alcohols of monovalence and the carboxylic acids of monovalence etc.)

[0040] the number average molecular weight of polyarylate resin — 1x10<sup>4</sup> to 30x10<sup>4</sup> [ for example, ] extent — desirable — 2x10<sup>4</sup> to 20x10<sup>4</sup> extent — further — desirable — 3x10<sup>4</sup> to 10x10<sup>4</sup> It is extent.

[0041] the addition of the polymer (B) which has a bisphenol frame in the polyester resin constituent of this invention — the thermoplastic polyester (resin A) 100 weight section — receiving — the 10 - 100 weight section — desirable — 20 - 90 weight section — it is 30 - 85 weight section extent still more preferably. If there is little polymer (B) which has a bisphenol frame, fire retardancy will not fully be acquired, but if many [ too ], the mechanical characteristic of a resin constituent and thermal resistance will fall.

[0042] The denaturation olefin system polymer used as a (C) component by [denaturation olefin system polymer (C)] this invention has denaturalized by at least one sort as which the olefin system polymer (c-1) was chosen from unsaturated carboxylic acid and its derivative (c-2).

[0043] Homopolymer [ of an olefin system monomer ], copolymer or olefin system monomer, alpha, and beta-unsaturated carboxylic acid or a copolymer with the ester is contained in an olefin system polymer (c-1). The homopolymer or copolymer of the above-mentioned olefin system monomer It consists of at least one sort of monomers chosen from the olefin system monomer. Above-mentioned olefin system monomer, alpha, and beta-unsaturated carboxylic acid or the copolymer with the ester It consists of at least one sort of monomers chosen from monomers [ which were chosen from the olefin system monomer / at least one sort of ], alpha, and beta-unsaturated carboxylic acid, or its ester, and each such an olefin system polymer can be used preferably. A copolymer is random, a block, or a graft copolymer.

[0044] As an olefin system monomer, unsaturated hydrocarbon monomers, such as an alpha olefin (alpha olefin of the carbon numbers 2-20, such as an ethylene, propylene, 1-butene, 2-butene, isobutene, 3-methyl-1-butene, 2-methyl-2-butene, 1-hexene, 2, and 3-dimethyl-2-butene, 1-heptene, 1-octene, 1-nonene, 1-decene, and 1-dodecen), are mentioned. these monomers are independent — or two or more sorts can be used, combining. A desirable olefin system monomer contains ethylene or a propylene (especially ethylene) at least.

[0045] As Above alpha, beta-unsaturated carboxylic acid, and its ester alpha, beta-unsaturated carboxylic acid (for



example, acrylic acid (meta) etc.), acrylic ester (meta) for example, a methyl acrylate (meta) and an ethyl acrylate (meta) — Acrylic-acid (meta) C1-10 alkyl ester, such as acrylic-acid propyl, butyl acrylate (meta), and 2-ethylhexyl acrylate (meta); (meta) Acrylic-acid hydroxyethyl, (Meta) Acrylic-acid (meta) hydroxy [ 2-4 ] C, such as acrylic-acid hydroxypropyl Alkyl ester etc. can be illustrated. Desirable alpha and beta-unsaturated-carboxylic-acid ester are acrylic-acid (meta) C 1-4, such as a methyl acrylate (meta), an ethyl acrylate (meta), acrylic-acid (meta) propyl, and butyl acrylate (meta). It is alkyl ester and is acrylic-acid C 1-4 especially. Alkyl ester (ethyl acrylate etc.) is desirable. these alpha, beta-unsaturated carboxylic acid, or its ester is independent — or two or more sorts can be used, combining. the amount of alpha and beta-unsaturated carboxylic acid or its ester used — for example, 0-30-mol% of the whole monomer — it can choose from the range of about 1-20 mol % preferably.

[0046] in addition, an olefin system monomer — except for said component — a nonconjugated diene compound (1 and 4-hexadiene —) The nonconjugated diene of the carbon numbers 6-10, such as dicyclopentadiene, 5-ethylidene-2-norbornene, 2, and 5-NORUBONA diene, conjugated diene (the conjugated diene compound of the carbon numbers 4-6, such as a butadiene, an isoprene, and piperylene, —) An aromatic series vinyl compound (for example, styrene, alpha methyl styrene), vinyl ether (for example, vinyl methyl ether), the polydyorganosiloxane (vinyl content silicone) that has a vinyl group may be used together in the range which does not check the effectiveness of this invention.

[0047] As a concrete olefin system polymer (c-1), polyethylene, polypropylene, a polyethylene-propylene copolymer, an ethylene-(meta) methyl-acrylate copolymer, and an ethylene-(meta) ethyl-acrylate copolymer are mentioned, for example.

[0048] As unsaturated carboxylic acid or its derivative (c-2), a maleic acid, a citraconic acid, an itaconic acid, a tetrahydrophtal acid, a NAJIKKU acid, a methyl NAJIKKU acid, an allyl compound succinic acid, an acrylic acid (meta), etc. are mentioned. These denaturation components are independent, or they can be used, combining them two or more sorts. Usually, a maleic anhydride and/or (meta) an acrylic acid are used.

[0049] the amount of denaturation (the amount of installation) according [ on a denaturation olefin system polymer (C) and ] to unsaturated carboxylic acid or its derivative (b-2) — 0.1 - 5-% of the weight (for example, 0.1 - 4 % of the weight) extent — it is about 0.5 - 3 % of the weight preferably. When there are too few amounts of denaturation by unsaturated carboxylic acid or its derivative (c-2), a denaturation olefin system polymer (C) may dissociate from a thermoplastic polyester component (A) remarkably, and problems, such as exfoliation and a mold deposit, may arise at the time of shaping. On the other hand, when there are too many amounts of denaturation by unsaturated carboxylic acid or its derivative (c-2), the fault of a nasty smell occurring by the unreacted (c-2) component which remains arises.

[0050] As an approach of obtaining a denaturation olefin system polymer (B) For example, unsaturated carboxylic acid or its derivative (c-2) is heated with radical initiators, such as suitable organic peroxide, in the state of melting. The approach made [ an olefin system polymer (c-1) ] to carry out graft denaturation (how to make a graft copolymer generate). The monomer which contains an olefin system monomer at least (or or [ Olefin monomer ] independent, an olefin monomer, acrylic ester (meta) and/or (meta) a mixed monomer with an acrylic acid), The approach of carrying out the polymerization of unsaturated carboxylic acid and/or its derivative (c-2) etc. is mentioned. Especially the method of carrying out the graft copolymerization of unsaturated carboxylic acid and/or its derivative (c-2) to an olefin system polymer (c-1) is easy to control the presentation ratio of each component.

[0051] As a denaturation olefin system polymer (C), the acrylic-acid (meta) denaturation olefin system polymer corresponding to maleic-anhydride denaturation polyethylene, maleic-anhydride denaturation polypropylene, maleic-anhydride denaturation (ethylene-(meta) methyl-acrylate copolymer), maleic-anhydride denaturation (ethylene-(meta) ethyl-acrylate copolymer), and these polymers etc. can be illustrated.

[0052] You may use it combining two or more denaturation olefin system polymers (C). For example, the combination of maleic-anhydride denaturation polyethylene and a maleic anhydride (ethylene-ethyl-acrylate copolymer), the combination of maleic-anhydride denaturation polypropylene and maleic-anhydride denaturation (ethylene-methyl-methacrylate copolymer), etc. can be used.

[0053] the total amount 100 weight section of the polymer (B) with which the addition of a denaturation olefin system polymer (C) has thermoplastic polyester resin (A) and a bisphenol frame in the polyester resin constituent of this invention — receiving — 0.5 - 18 weight section (for example, 1 - 15 weight section) extent — it is 1 - 10 weight section (for example, 2 - 8 weight section) extent preferably. (C) If an improvement of properties, such as a sliding property, is not improved greatly but a component exceeds 18 weight sections under in the 0.5 weight section, abrasion resistance and rigidity will fall and dimensional accuracy and the appearance of mold goods will fall.

[0054] The aliphatic series ester (D) used by [aliphatic series ester (D)] this invention consists of a fatty acid and fatty alcohol. as a fatty acid — the saturated fatty acid (for example, a lauric acid —) of a straight chain or branched chain A tridecane acid, a myristic acid, a palmitic acid, stearin acid, isostearic acid, Behenic acid, arachidic acid, a lignoceric acid, a SECHIRON acid, a montanoic acid, saturation, such as a melissic acid, — high-class — the unsaturated fatty acid (oleic acid —) of C10-30 fatty acid, a straight chain, or branched chain Partial saturation high-class C 18-20, such as linolic acid and a linolenic acid Fatty acid, polybasic acid (the polybasic acid of the carbon numbers 2-10 of a succinic acid, an adipic acid, a sebacic acid, etc. —) And the derivatives (for example, fatty acids by which the hydroxy permutation was carried out, such as a halogenide of fatty acids, such as 2-BUROMO stearin acid and 18-BUROMO stearin acid, and 18-hydroxy stearin acid) of said fatty acid are mentioned. these fatty acids are independent — or two or more sorts can be used, combining. A desirable fatty acid is